

Arborescent Angiosperms of Mundanthurai Range in the Kalakad-Mundanthurai Tiger Reserve (KMTR) of the southern Western Ghats, India

Paulraj Selva Singh Richard^{1*} and Selvaraj Abraham Muthukumar²

1 Madras Christian College, Department of Botany, Chennai – 600 059, Tamil Nadu, India.

2 St. John's College, Department of Botany, Tirunelveli, 627 002, Tamil Nadu, India.

* Corresponding author. E-mail: ssrichard2001@gmail.com

ABSTRACT: The present study was carried out to document the diversity of arborescent angiosperm taxa of Mundanthurai Range in the Kalakad-Mundanthurai Tiger Reserve (KMTR) of the southern Western Ghats in India. During the floristic survey carried out from January 2008 to December 2010, a total of 247 species and intraspecific taxa of trees and shrubs representing 175 genera in 65 families were recorded. The most speciose families are Euphorbiaceae (27 spp.), Rubiaceae (17 spp.), Myrtaceae (14 spp.), Lauraceae (13 spp.) and Annonaceae (11 spp.). Of the 247 taxa, 27 species are endemic only to this region which includes *Agasthiyamalaia pauciflora*, *Elaeocarpus venustus*, *Garcinia travancorica*, *Gluta travancorica*, *Goniothalamus rhynchantherus*, *Homalium travancoricum*, *Homaium jainii*, *Orophea uniflora*, *Phlogacanthus albiflorus*, *Polyalthia shendurunii*, *Symplocos macrocarpa* and *Symplocos sessilis*. This clearly signifies that this range is relevant to the conservation of the local flora.

INTRODUCTION

The Western Ghats is one of the biodiversity hotspots of the world (Myers *et al.* 2000). It is a mountainous range extending from the mouth of the river Tapti in Gujarat to Kanyakumari in Tamil Nadu. The floristic diversity of the Western Ghats is very significant as this hill range accommodates different vegetation types such as wet evergreen forests, moist and dry deciduous forests, montane forests, sholas, scrubs and savannas. Some of prominent research on the documentation of the tree species of the Western Ghats are Pascal and Pelissier's (1996) report on 103 tree species of Uppangala, a part of central Western Ghats, Parthasarathy's (1999) documentation of 122 woody species (114 trees) belonging to 89 genera and 41 families from southern Western Ghats and recently a compilation by Ramesh *et al.* (2007) of 526 arborescent species distributed in the Western Ghats and 241 of these in the southern Western Ghats. Ganesh *et al.* (1996) recorded 140 species of woody angiosperms from the Kalakad-Mundanthurai Tiger Reserve, southern Western Ghats. Other documentations exclusively on the Agasthiyamalai region's tree species were by Gopalan and Henry (2000), Mohanan and Sivadasan (2002) and Annamalai (2004). The Western Ghats also have a high proportion of endemism, comprising 1720 endemic species (i.e about 40%) out of c. 4500 species of flowering plants (Kaveriappa and Shetty 2001). Among the endemic species, 63% were represented by trees and the southern region of Western Ghats is rich in endemism by having 1051 endemic species (Ramesh and Pascal 1991; Tissot *et al.* 1994; Viswanathan 1999).

The Kalakad-Mundanthurai Tiger Reserve (KMTR) is situated in the southern Western Ghats in Tirunelveli district, Tamil Nadu, forming a part of the Agasthiyamalai region. This region is one of the plant diversity centres in

India for conserving global biological diversity and also declared as Regional Centre of Endemism in the Indian subcontinent (Davis *et al.* 1995). There are c. 2255 species of Angiosperms so far recorded from Kalakad-Mundanthurai Tiger Reserve, including 448 species endemic to the Western Ghats; in addition 150 species are strict endemics of the Agasthiyamalai region. This high rate of endemism is mostly attributed to the short dry period (1–4 months). The leeward side of Agasthiyamalai and Kalakad hills appears to be the zones of active speciation (Henry *et al.* 1984). The region also represents a rich reservoir for a large number of wild relatives of cultivated plant species (Viswanathan 1999; Gopalan and Henry 2000; Annamalai 2004).

Some of the recent studies that describe the importance of this region include Pascal *et al.* 1997; Gopalan and Henry 2000; Manickam *et al.* 2003; Ramesh *et al.* 2007. In recent years many new species were discovered and reported as a result of repeated field exploration: *Memecylon manickamii* (Murugan *et al.* 2000); *Memecylon tirunelvelicum* (Murugan *et al.* 2001); *Memecylon mundanthuraianum*, *Polyalthia tirunelveliensis*, (Viswanathan and Manikandan 2001a, b); *Glochidion balakrishnanii* (Jothi *et al.* 2002); *Xanthophyllum manickamii* (Murugan 2002); *Miliusa tirunelvelica* (Murugan *et al.* 2004); *Schefflera agasthiyamalayana* (Manickam *et al.* 2007); *Syzygium agasthiyamalayana* (Viswanathan and Manikandan 2008).

The present study was carried out with the objective of documenting the arborescent angiosperms of Mundanthurai Range of Agasthiyamalai Biosphere Reserve, southern Western Ghats, India in an exclusive manner.

MATERIALS AND METHODS

Study area

Mundanthurai Range lies between 08°31' N – 08°48' N

and 77°10' E – 77°21' E. It is situated on the eastern slope of Agasthiyamalai Biosphere Reserve and covers an area of about 270 km² (Figure 1). It is one of the important ranges in Kalakad–Mundanthurai Tiger Reserve (KMTR) of Tirunelveli district, Tamil Nadu, sharing the Agasthiyamalai peak (1868 m) with the neighbouring state, Kerala. This study area also covers a wide array of forest types such as southern tropical thorn forests (200 m), southern tropical dry deciduous forests (300 m), grasslands at lower altitude (500 m), southern tropical moist deciduous forests (500 m), Tirunelveli-semi evergreen forests (700 m), southern tropical wet evergreen (rain) forests (800 – 1500 m), subtropical montane forests and grasslands at higher altitude (>1500 m) (Gopalan and Henry 2000).

Data collection

The study area has been explored from January 2008 to December 2010 covering various seasons. A total of 36 field trips (120 field days) were conducted to the study area. The voucher specimens were collected and identified using local floras such as Beddome 1868 – 1874; Bourdillon 1908; Gamble and Fischer 1915 – 1936; Gopalan and Henry 2000 and the Biotik – Western Ghats v. 1.0 software application (Ramesh *et al.* 2007). The identity on the species was later confirmed by comparing specimens with authentic specimens at Madras Herbarium (MH), Coimbatore; French Institute of Pondicherry Herbarium (IFPH), Puducherry, St. Xavier's College Herbarium (XCH), Tirunelveli and M.S. Swaminathan Research Foundation, Community Agrobiodiversity Centre Herbarium, Wayanad (MSSH). The families were classified according to Bentham and Hooker Classification (1862 – 1883), with some alterations based on split-up of various families. The families as well as the genera are arranged in alphabetical order. All the processed voucher specimens were deposited at the Herbarium of French Institute (IFPH), Pondicherry.

RESULTS AND DISCUSSION

During the floristic survey, a total of 247 species

representing 175 genera distributed in 65 families were recorded from Mundanthurai range of southern Western Ghats (Table 1). This includes 218 species of canopy and understorey trees, 23 species of shrubs (height < 5m, DBH > 1cm) and 6 species of woody climbers. The most speciose families of the study area include Euphorbiaceae with 27 species, followed by Rubiaceae (17 spp.), Myrtaceae (14 spp.), Lauraceae (13 spp.) and Annonaceae (11 spp.). Ganesh *et al.* (1996) also mentioned Lauraceae, Rubiaceae and Euphorbiaceae as the three most dominant families in terms of species richness in the forest. The most speciose genera include *Eugenia* (8 spp.), followed by *Syzygium* (6 spp.), 5 spp. each in *Garcinia*, *Elaeocarpus* and *Memecylon*, 4 spp. each in *Diospyros*, *Terminalia* and *Mallotus*. The pictures of selected species are given in Figures 2 – 4. Of the 247 arboreal taxa, about 88% consist of evergreen species.

In this study, tree species that are predominantly associated with their respective vegetation were assessed: *Albizia odoratisima*, *Bauhinia racemosa*, *Capparis grandis*, *Erythroxylon monogynum* are some of the important species distributed in southern tropical thorn forests that exist around Mundanthurai and its adjoining areas. The southern tropical dry deciduous forests existing near Servalar, Karaiyar, Kattlemalai and Papanasm region are commonly associated with species such as *Albizia odoratisima*, *Lannea coromandelica*, *Pterocarpus marsupium*, *Terminalia chebula*, *Hiptage benghalensis*, *Vitex altissima*. Grasslands at lower altitude (500 m), southern tropical moist deciduous forests (500 m) includes tree species such as *Dillenia pentagyna*, *Acrorychia pedunculata*, *Pterocarpus marsupium*, *Bridelia scandens*, *Clausena indica*, *Glochidion ellipticum*, *Terminalia paniculata*, *Helectres isora*, *Careya arborea* as important components. Tirunelveli-semi evergreen forests (700 m) in patches and belts commonly occur in Injikuzhi, Kannikatty, 8th mile with commonly occurring species such as *Antidesma menasu*, *Erythroxylon lanceolatum*, *Filicium decipiens*, *Gordonia obtusa*, *Holigarna arnottiana*, *Diospyros spp.*, *Cleistanthus travancorensis*, *Psychotria nigra*, *Gomphia serrata*. Southern hilltop tropical evergreen forests (800 – 1500 m) common in Chinnapul, Kaliparpuli (Pandipathu), Chemunji and Upmamottai region include *Agasthiyamalaia pauciflora*, *Cullenia exarillata*, *Dimocarpus longon*, *Elaeocarpus tuberculatus*, *Mesua ferrea*, *Garcinia rubric-echinata*, *Gluta travancorica*, *Hopea parviflora* as top canopy, *Syzygium mundagam*, *Elaeocarpus serratus*, *Knema attenuata*, *Cinnamomum spp.* as shade loving canopy, *Acrorychia pedunculata*, *Agrostistachys borneansis*, *Callicarpa tomentosa*, *Elaeocarpus munronii*, *Eurya nitida*, *Goniothalamus wightii*, *G. rhyncantherus*, *Humboltia unijuga*, *Tabernaemontana heyneana* as a third layer. Subtropical montane forests confined to Agasthiyamalai, Kandhavarai, Purangal, Aduppukkal include species such as *Ilex wightiana*, *Photinia notoniana*, *Aglaiia bourdillonii*, *Euphorbia santapau*, *Canthium angustifolium*, *Actinodaphne spp.*, *Euonymous spp.* along with *Ochlandra travancorica*. Grasslands at higher altitude (>1500 m) confined to Chinnapul, Kaliparpul, Upmamottai, Pandiyankottai having species such as *Arundinella purpurea*, *Chrysopogon orientalis*, *Themeda tremula* along with *Acrotrema arnottianum*, *Vernonia peninsularis*.

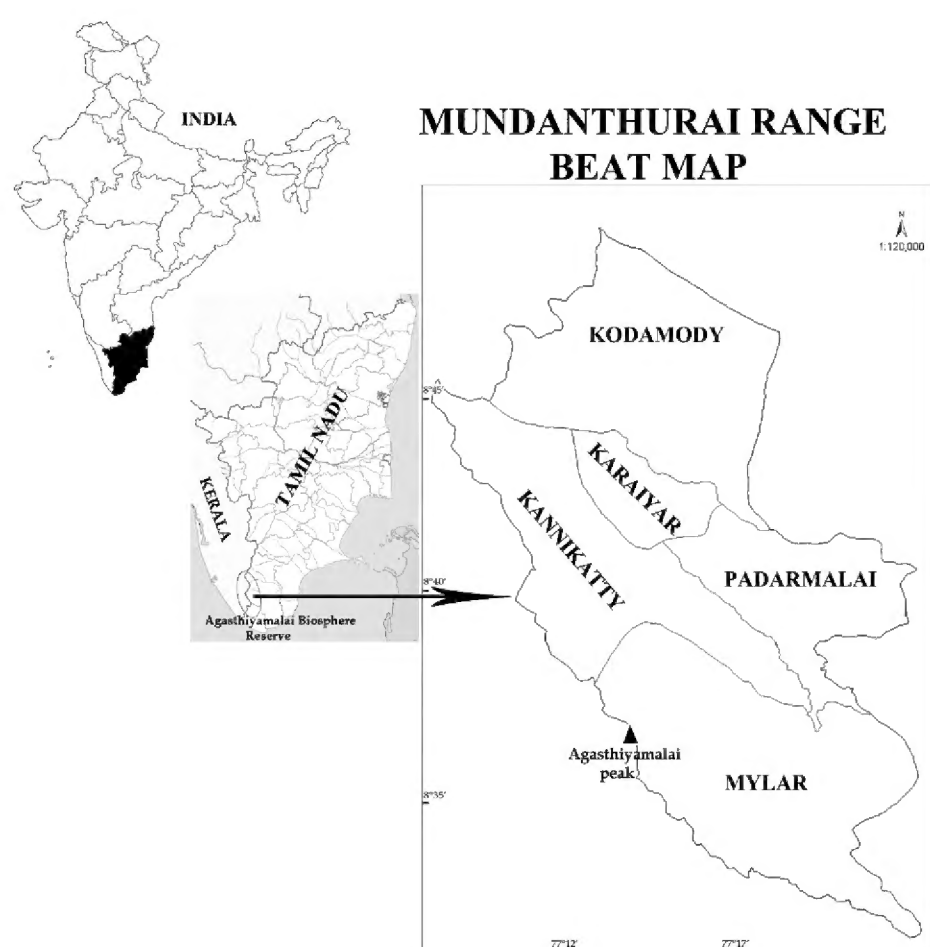


FIGURE 1. Map indicating the location of Tirunelveli district, Tamil Nadu state, where the study area, Mundanthurai Range, is located.

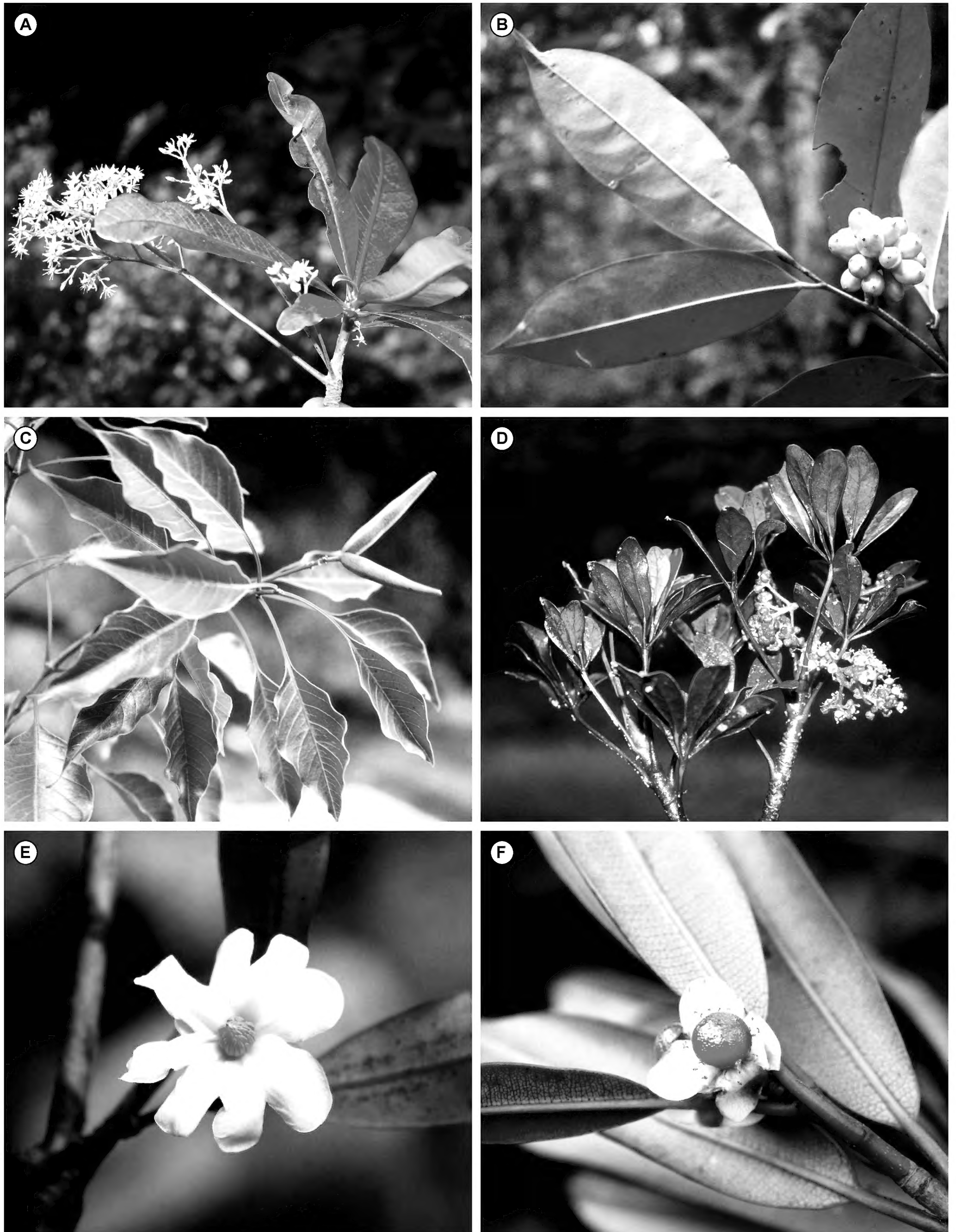


FIGURE 2. Some important species of Mundanthurai Range, KMTR, southern Western Ghats, India, ANACARDIACEAE: A. *Gluta travancorica* Bedd.; ANNONACEAE: B. *Goniothalamus rhynchantherus* Dunn; ARALIACEAE: D. *Schefflera bourdillonii* Gamble; ASCLEPIADACEAE: C. *Decalepis arayalpathra* (Joseph and V. Chandras.) Venter; BONNETIACEAE: E. *Agasthiyamalaia pauciflora* (Bedd.) S. Rajkumar and Janarth.; CLUSIACEAE: F. *Garcinia travancorica* Bedd.

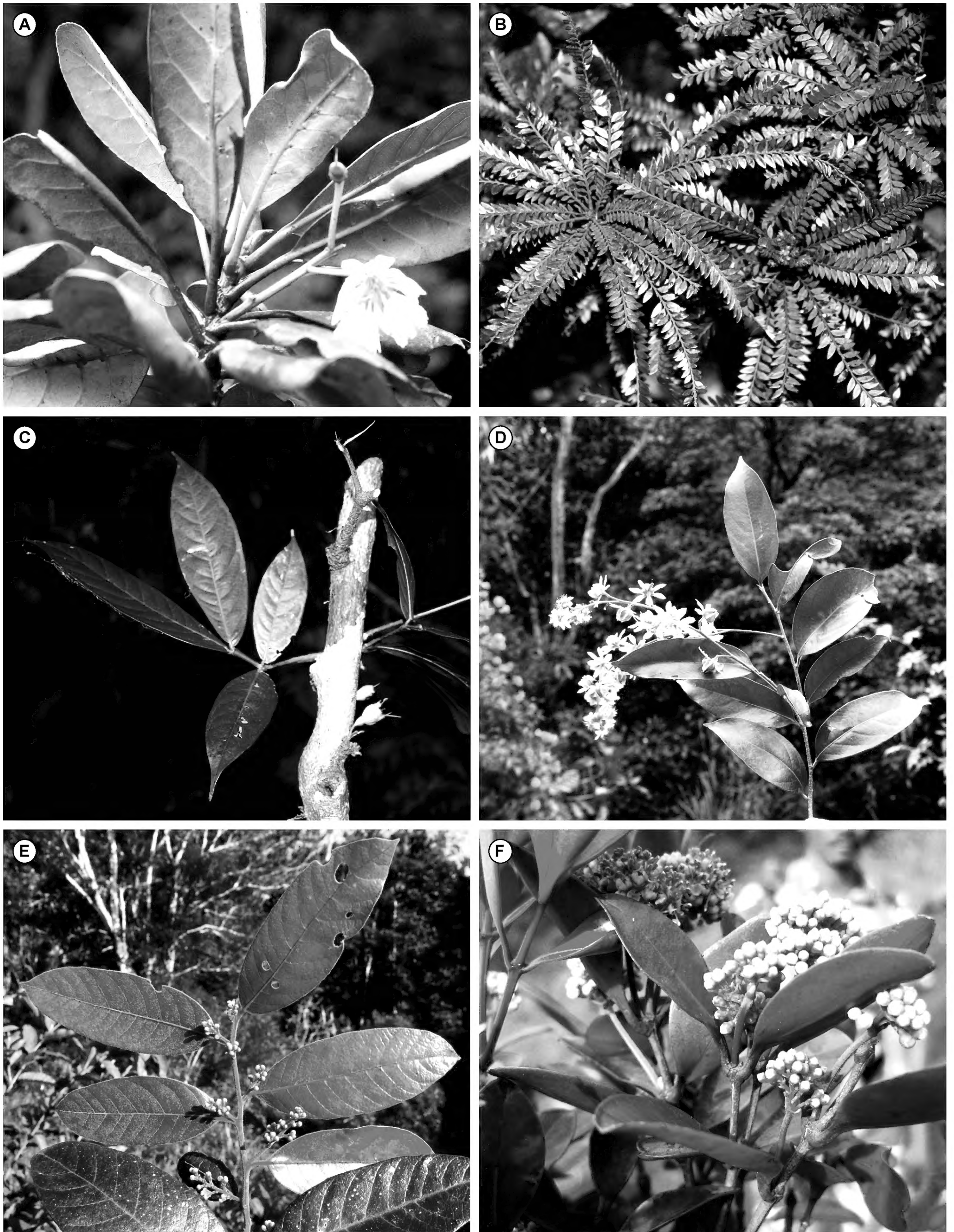


FIGURE 3. ELAEOCARPACEAE: A. *Elaeocarpus venustus* Bedd.; EUPHORBIACEAE: B. *Phyllanthus singampattianus* (Sebastine and Henry) Kumari and Chandrabose; FABACEAE: C. *Humboldtia unijuga* Bedd.; FLACOURTIACEAE: D. *Homalium jainii* Henry and Swamin.; LAURACEAE: E. *Cryptocarya anamalayana* Gamble (Lauraceae); MELASTOMATACEAE: F. *Memecylon manickamii* Murugan *et al.*

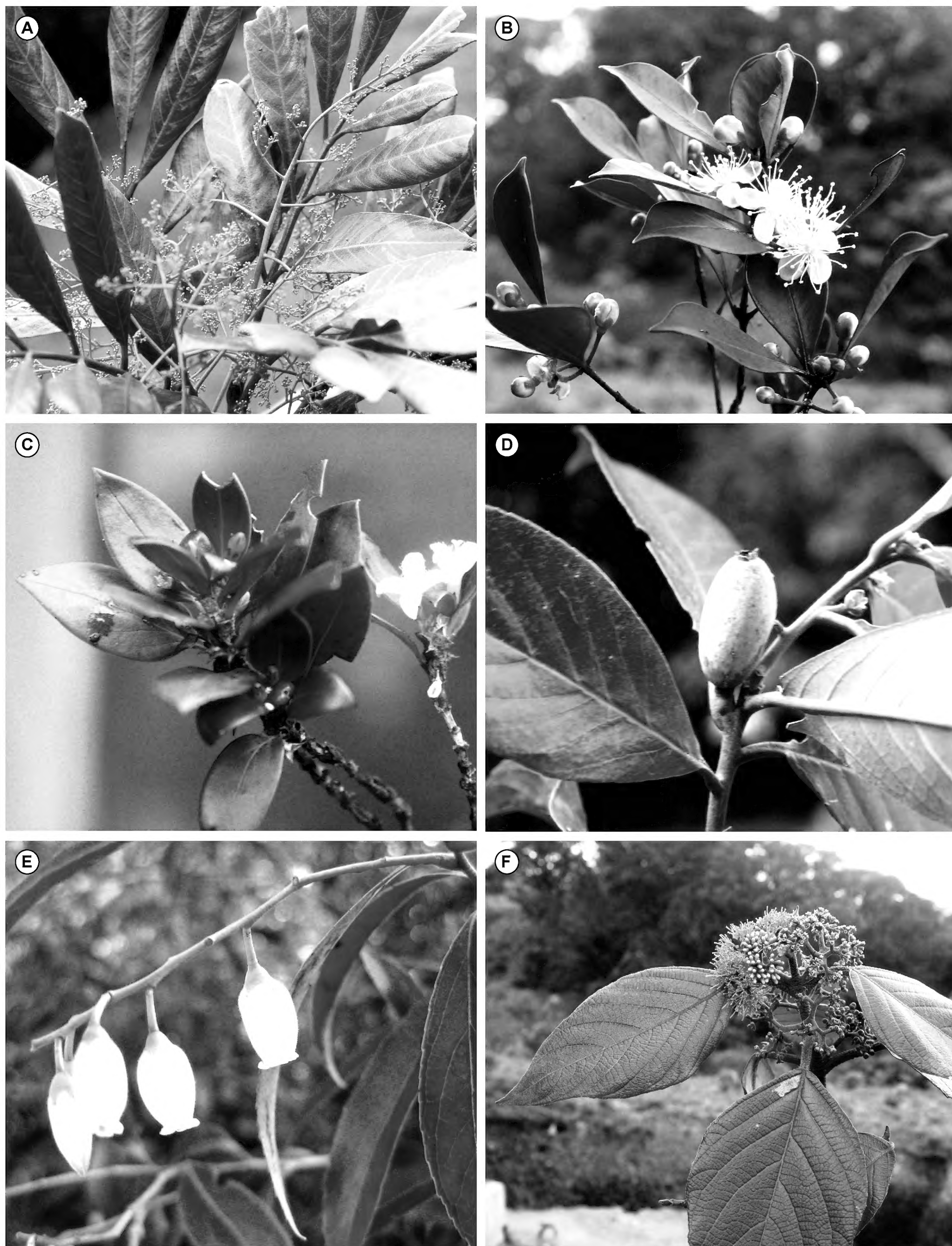


FIGURE 4. MELIACEAE: A. *Aglaia bourdillonii* Gamble; MYRTACEAE: B. *Eugenia discifera* Gamble; RUBIACEAE: C. *Hedyotis travancorica* Bedd.; SYMPLOCACEAE: D. *Symplocos macrocarpa* Wight ex C.B. Clarke; VACCINIACEAE: E. *Vaccinium neilgherrense* Wight; VERBENACEAE: F. *Callicarpa tomentosa* (L.) Murr.

In this study, 98 endemic species are documented of which 27 species are confined only to the Agasthiyamalai region that includes some endemic and threatened species such as *Agasthiyamalaia pauciflora*, *Elaeocarpus venustus*, *Garcinia travancorica*, *Gluta travancorica*, *Goniothalamus rhynchantherus*, *Homalium travancoricum*, *Orophea uniflora*, *Phlogacanthus albiflorus*, *Polyalthia shendurunii*, *Symplocos macrocarpa*, *Symplocos sessilis* and *Tricalysia apiocarpa*. Gopalan and Henry (2000) assessed the status of 125 strict endemics of the Tamil Nadu part of the Agasthiyamalai region’s eastern slopes, of which 83 are woody species including 46 species of trees and 37 species of shrubs. Mohanan and Sivadasan (2002) recorded 297 tree species from western slopes (windward side) of the Agasthiyamalai region. Ganesh *et al.* (1996) recorded 173

species of angiosperms from the Kalakad-Mundanthurai Tiger Reserve, southern Western Ghats, of which 90 species of trees and 50 species of shrubs. Annamalai (2004) reported *c.* 500 species of trees from the entire Kalakad-Mundanthurai Tiger Reserve. In the present study the number of arboreal species documented within an area of 270 km² (Mundanthurai Range) is more complete when compared to previous studies.

This list provides comprehensive information on the recent floristic diversity of the Mundanthurai Range in the Kalakad-Mundanthurai Tiger Reserve, updating the species diversity including new species, endemic and threatened and resulting in a good database that will be useful to implement better conservation strategies and management of tropical forests and ecosystems.

TABLE 1. List of Trees and Shrubs from Mundanthurai Range, KMTR, southern Western Ghats, Tamil Nadu, India with their family, binomial, habit, endemism and voucher number. S: Shrub; LS: Large shrub; ST: Small tree; T: Tree; WC: Woody climber; LE: Local endemic; SWG: southern Western Ghats; WG: Western Ghats; EPI: Endemic to Peninsular India; SWG & SL: commonly endemic to southern Western Ghats of India and Sri Lanka.

SL. NO.	FAMILY AND BINOMIAL	HABIT	ENDEMISM	VOUCHER NO.
ACANTHACEAE				
1.	<i>Eranthemum capense</i> L.	S	LE	SSR47
2.	<i>Phlogacanthus albiflorus</i> Bedd.	S	SWG	SSR291
3.	<i>Phlogacanthus grandis</i> T.Anderson	S	SWG	SSR204
ANACARDIACEAE				
4.	<i>Gluta travancorica</i> Bedd. (Figure 2:A)	T	LE	SSR137
5.	<i>Holigarna arnottiana</i> Hook.f.	T	WG	SSR127
6.	<i>Lannea coromandelica</i> (Houtt) Merr.	T	-	SSR64
7.	<i>Nothopegia heyneana</i> (Hook.f.) Gamble	T	WG	SSR95,115
8.	<i>Semecarpus anacardium</i> L.f.	T	-	SSR37
9.	<i>Spondias pinnata</i> (L.f.) Kurz	T	-	SSR64, 172
ANNONACEAE				
10.	<i>Alphonsea sclerocarpa</i> Thw.	T	-	SSR268
11.	<i>Alphonsea zeylanica</i> Hook.f. and Thomson	T	SWG & SL	SSR33
12.	<i>Artabotrys zeylanicus</i> Hook.f. and Thomson	WC	-	SSR229
13.	<i>Goniothalamus rhynchantherus</i> Dunn (Figure 2: B)	T	LE	SSR223
14.	<i>Goniothalamus wightii</i> Hook.f. and Thomson	T	SWG	SSR68,183
15.	<i>Meiogyne pannosa</i> (Dalz.) Sinclair	ST	WG	SSR211
16.	<i>Miliusa eriocarpa</i> Dunn	S	SWG	SSR113
17.	<i>Mitrephora heyneana</i> (Hook.f. and Thomson) Thwaites	ST	SWG & SL	SSR196
18.	<i>Orophea uniflora</i> Hook.f. and Thomson	ST	WG	SSR255
19.	<i>Polyalthia korinti</i> (Dunal) Hook.f. and Thomson	ST	-	SSR31
20.	<i>Polyalthia shendurunii</i> Basha and Sasidh.	T	LE	SSR79
APOCYNACEAE				
21.	<i>Alstonia scholaris</i> (L.) R. Br.	T	-	SSR138
22.	<i>Alstonia venenata</i> R. Br.	T	-	SSR174
23.	<i>Tabernaemontana gamblei</i> Subr. and A.N. Henry	S	SWG	SSR224
24.	<i>Tabernaemontana heyneana</i> Wall.	T	-	SSR246
25.	<i>Wrightia tinctoria</i> R. Br.	T	-	SSR245
AQUIFOLIACEAE				
26.	<i>Ilex wightiana</i> Wall. ex Wight	T	SWG & SL	SSR236
ARALIACEAE				
27.	<i>Schefflera bourdillonii</i> Gamble (Figure 2: C)	ST	LE	SSR282
28.	<i>Schefflera exalata</i> (Thwaites) Frodin	T	-	SSR130
ARECACEAE				
29.	<i>Arenga wightii</i> Griff.	T	-	SSR216
30.	<i>Bentinckia condapanna</i> Berry ex Roxb.	T	SWG	SSR239
31.	<i>Calamus pseudotenuis</i> Becc.	S	-	SSR218
ASCLEPIADACEAE				
32.	<i>Decalepis arayalpathra</i> (Joseph and V. Chandras.) Venter (Figure 2: D)	S	LE	SSR238
ASTERACEAE				
33.	<i>Vernonia salviifolia</i> Wight	S	SWG	SSR265

TABLE 1. CONTINUED.

SL. NO.	FAMILY AND BINOMIAL	HABIT	ENDEMISM	VOUCHER NO.
34.	<i>Vernonia travancorica</i> Hook.f.	T	SWG	SSR184
BIGNONIACEAE				
35.	<i>Spathodea campanulata</i> P. Beauv.	T	-	SSR155
36.	<i>Stereospermum colais</i> (Buch.-Ham. ex Dillwyn) Mabb.	T	-	SSR106
BOMBACACEAE				
37.	<i>Bombax ceiba</i> L.	T	-	SSR35
38.	<i>Cullenia exarillata</i> A.Robyns	T	WG	SSR135
BONNETIACEAE				
39.	<i>Agasthiyamalaia pauciflora</i> (Bedd.) S. Rajkumar and Janarth. (Figure 2: E)	T	LE	SSR163, 198
BURSERACEAE				
40.	<i>Canarium strictum</i> Roxb.	T	-	SSR177
CAPPARACEAE				
41.	<i>Cadaba trifoliata</i> (Roxb.) Wight and Arn.	ST	-	SSR287
42.	<i>Capparis grandis</i> L.f.	T	-	SSR267
CAPRIFOLIACEAE				
43.	<i>Viburnum punctatum</i> Buch.-Ham. ex D. Don	T	-	SSR266
CELASTRACEAE				
44.	<i>Euonymus dichotomus</i> Heyne ex Roxb.	T	WG	SSR88
45.	<i>Lophopetalum wightianum</i> Arn.	T	-	SSR91
46.	<i>Pleurostylia opposita</i> (Wall.) Alston	T	-	SSR111
CLUSIACEAE				
47.	<i>Calophyllum austroindicum</i> Kosterm. ex P.F. Stevens	T	SWG	SSR249
48.	<i>Calophyllum pascalianum</i> B. R. Ramesh, N. Ayyappan and De Franceschi	T	-	SSR175
49.	<i>Garcinia gummi-gutta</i> (L.) Robs.	T	WG	SSR178, 208
50.	<i>Garcinia morella</i> (Gaertn.) Desr.	T	-	SSR87
51.	<i>Garcinia rubro-echinata</i> Kosterm.	T	SWG	SSR159
52.	<i>Garcinia thalbotii</i> Raizada and Santapau	T	WG	SSR85
53.	<i>Garcinia travancorica</i> Bedd. (Figure 2: F)	T	LE	SSR136, 206
54.	<i>Mesua ferrea</i> L.	T	-	SSR14
COMBRETACEAE				
55.	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Bedd.	T	-	SSR114
56.	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight and Arn.	T	-	SSR54
57.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	T	-	SSR83
58.	<i>Terminalia chebula</i> Retz.	T	-	SSR58
59.	<i>Terminalia paniculata</i> Roth	T	EPI	SSR241
DATISCACEAE				
60.	<i>Tetrameles nudiflora</i> R. Br.	T	-	SSR103
DILLENiaceae				
61.	<i>Dillenia pentagyna</i> Roxb.	T	-	SSR179
DIPTEROCARPACEAE				
62.	<i>Dipterocarpus bourdilloni</i> Brandis	T	WG	SSR162
63.	<i>Hopea parviflora</i> Bedd.	T	WG	SSR154
64.	<i>Hopea utilis</i> (Bedd.) Bole	T	LE	SSR55
EBENACEAE				
65.	<i>Diospyros affinis</i> Thwaties	T	LE	SSR176, 188
66.	<i>Diospyros bourdilloni</i> Brandis	T	WG	SSR207, 221
67.	<i>Diospyros foliolosa</i> Wall. ex A. DC.	T	SWG	SSR187
68.	<i>Diospyros melanoxylon</i> Roxb.	T	-	SSR82
ELAEOCARPACEAE				
69.	<i>Elaeocarpus galndulosus</i> Wall. ex Merr.	T	-	SSR80
70.	<i>Elaeocarpus munronii</i> (Wight) Masters	T	WG	SSR133
71.	<i>Elaeocarpus serratus</i> L.	T	-	SSR260
72.	<i>Elaeocarpus tuberculatus</i> Roxb.	T	-	SSR72
73.	<i>Elaeocarpus venustus</i> Bedd. (Figure 3: A)	T	LE	SSR235
ERYTHROXYLACEAE				
74.	<i>Erythroxylum lanceolatum</i> (Wight) Walp.	ST	WG	SSR217
EUPHORBIACEAE				
75.	<i>Actephila excelsa</i> (Dalzell) Muell.-Arg.	ST	-	SSR120
76.	<i>Agrostistachys borneensis</i> Becc.	T	-	SSR233,234



TABLE 1. CONTINUED.

SL. NO.	FAMILY AND BINOMIAL	HABIT	ENDEMISM	VOUCHER NO.
77.	<i>Aleurites moluccana</i> (L.) Willd.	T	-	SSR247
78.	<i>Antidesma bunius</i> (L.) Spreng.	T	-	SSR181
79.	<i>Antidesma montanum</i> Blume	ST	-	SSR248
80.	<i>Baccaurea courtallensis</i> (Wight) Muell.-Arg.	T	WG	SSR25
81.	<i>Bridelia scandens</i> (Roxb.) Willd.	WC	-	SSR21
82.	<i>Cleistanthus travancorensis</i> Jabl.	T	SWG	SSR173
83.	<i>Coelodepas calycinum</i> Bedd.	T	SWG	SSR171
84.	<i>Croton klotzschianus</i> (Wight) Thw.	T	-	SSR18
85.	<i>Dimorphocalyx beddomei</i> (Benth.) Airy Shaw	T	LE	SSR43, 254
86.	<i>Dimorphocalyx lawianus</i> Hook.f.	T	WG	SSR17, 70
87.	<i>Epiprinus mallotiformis</i> (Muell.-Arg.) Croizat	T	-	SSR222
88.	<i>Euphorbia santhapau</i> Henry	S	LE	SSR134
89.	<i>Givotia rottleriformis</i> Griff.	T	-	SSR98
90.	<i>Glochidion ellipticum</i> Wight	T	WG	SSR144
91.	<i>Glochidion heyneanum</i> (Wight and Arn.) Wight	ST	-	SSR205
92.	<i>Macaranga peltata</i> (Roxb.) Muell.-Arg.	T	-	SSR90
93.	<i>Mallotus beddomei</i> Hook.f.	T	WG	SSR219, 220
94.	<i>Mallotus philippensis</i> (Lam.) Muell.-Arg.	T	-	SSR27
95.	<i>Mallotus rhamnifolius</i> Muell.-Arg.	T	-	SSR03
96.	<i>Mallotus tetracoccus</i> (Roxb.) Kurz	T	-	SSR213
97.	<i>Meineckia longipes</i> (Wight) G.L. Webster	S	WG	SSR214
98.	<i>Paracroton pendulus</i> (Hassk.) Miq. Subsp. <i>zeylanicus</i> (Thw.) N.P. Balakr. and Chakrab.	T	-	SSR105
99.	<i>Phyllanthus polyphyllus</i> Willd.	T	-	SSR96
100.	<i>Phyllanthus singampattiana</i> (Sebastine and Henry) Kumari and Chandrabose (Figure 3: B)	S	LE	SSR104
101.	<i>Suregada lanceolata</i> (Willd.) Kuntze	T	-	SSR30
FABACEAE – CAESALPINIOIDEAE				
102.	<i>Bauhinia racemosa</i> L.	T	-	SSR50
103.	<i>Humboldtia unijuga</i> Bedd. (Figure 3: C)	T	LE	SSR158
104.	<i>Kingiodendron pinnatum</i> (Roxb. ex DC.) Harms	T	WG	SSR84
FABACEAE – FABOIDEAE				
105.	<i>Derris brevipes</i> (Benth.) Baker	WC	WG	SSR190
106.	<i>Erythrina subumbrans</i> (Hassk.) Merr.	T	-	SSR161
107.	<i>Mundulea sericea</i> (Willd.) A. Chev.	ST	-	SSR150
108.	<i>Pterocarpus marsupium</i> Roxb.	T	-	SSR93
FABACEAE – MIMOSOIDEAE				
109.	<i>Albizzia odoratissima</i> Benth.	T	-	SSR97
110.	<i>Albizzia marginata</i> Merr.	T	-	SSR194
111.	<i>Archidendron monadelphum</i> (Roxb.) Nielson	T	-	SSR86, 118
FLACOURTIACEAE				
112.	<i>Casearia ovata</i> (Lam.) Willd.	T	-	SSR112
113.	<i>Homalium jainii</i> Henry and Swamin. (Figure 3: D)	T	LE	SSR131
114.	<i>Homalium travancoricum</i> Bedd.	T	SWG	SSR26
115.	<i>Hydnocarpus alpina</i> Wight	T	-	SSR61
116.	<i>Scolopia crenata</i> (Wight and Arn.) Clos	T	-	SSR101, 251
HERNANDIACEAE				
117.	<i>Gyrocarpus americanus</i> Jacq.	T	-	SSR52
HIPPOCRATACEAE				
118.	<i>Loeseneriella obtusifolia</i> (Roxb.) A.C. Sm.	WC	-	SSR38
119.	<i>Salacia fruticosa</i> B. Heyne ex M.A. Lawson	ST	WG	SSR285
ICACINACEAE				
120.	<i>Apodytes dimidiata</i> E. Meyer ex Arn.	T	-	SSR283
121.	<i>Gomphandra coriacea</i> Wight	T	-	SSR244
122.	<i>Gomphandra tetrandra</i> (Wall.) Sleumer	T	-	SSR212
LAMIACEAE				
123.	<i>Clerodendrum viscosum</i> Vent	ST	-	SSR06
124.	<i>Tectona grandis</i> L.f.	T	-	SSR149
125.	<i>Vitex altissima</i> L.	T	-	SSR24
126.	<i>Vitex leucoxydon</i> L.f.	T	-	SSR286

TABLE 1. CONTINUED.

SL. NO.	FAMILY AND BINOMIAL	HABIT	ENDEMISM	VOUCHER NO.
LAURACEAE				
127.	<i>Actinodaphne campanulata</i> Hook.f. var. <i>campanulata</i>	T	SWG	SSR292
128.	<i>Actinodaphne wightiana</i> (Kuntze) Noltie	T	WG	SSR259
129.	<i>Alseodaphne semecarpifolia</i> Nees	T	-	SSR81
130.	<i>Apollonias arnottii</i> Nees	ST	SWG	SSR210
131.	<i>Cinnamomum sulphuratum</i> Nees	T	WG	SSR182
132.	<i>Cryptocarya anamalayana</i> Gamble (Figure 3: E)	T	SWG	SSR156
133.	<i>Litsea bourdillonii</i> Gamble	T	SWG	SSR146
134.	<i>Litsea laevigata</i> (Nees) Gamble	T	WG	SSR143
135.	<i>Litsea oleoides</i> (Meissner) Hook.f.	T	-	SSR117,271
136.	<i>Litsea quinqueflora</i> (Dennst.) Suresh	ST	SWG	SSR263
137.	<i>Litsea venulosa</i> (Meissner) Hook.f.	ST	-	SSR258
138.	<i>Neolitsea scrobiculata</i> (Meissner) Gamble	T	-	SSR46
139.	<i>Neolitsea zeylanica</i> (Nees) Merr.	T	-	SSR148, 203
LECYTHIDACEAE				
140.	<i>Careya arborea</i> Roxb.	T	-	SSR57
LEEACEAE				
141.	<i>Leea indica</i> (Burm.f.) Merr.	T	-	SSR60
LOGANIACEAE				
142.	<i>Fagraea ceilanica</i> Thunb.	ST	-	SSR124
MALPIGHIACEAE				
143.	<i>Hiptage bengalensis</i> (L.) Kurz	WC	-	SSR169
MELASTOMATACEAE				
144.	<i>Memecylon angustifolium</i> Wight	S	LE	SSR94
145.	<i>Memecylon heyneanum</i> Benth. ex Wight and Arn.	S	SWG	SSR65
146.	<i>Memecylon manickamii</i> Murugan <i>et al.</i> (Figure 3: F)	ST	LE	SSR280
147.	<i>Memecylon subcordatum</i> Cogn.	S	LE	SSR284
148.	<i>Memecylon subramanii</i> A.N. Henry	S	LE	SSR228
149.	<i>Osbeckia minor</i> Triana ex Cogn.	S	SWG	SSR11
MELIACEAE				
150.	<i>Aglaia bourdillonii</i> Gamble (Figure 4: A)	T	-	SSR237
151.	<i>Aglaia elaeagnoidea</i> (A. Juss.) Benth. var. <i>courtallensis</i> (Gamble) Nair	T	LE	SSR04
152.	<i>Aglaia elaeagnoidea</i> (A. Juss.) Benth.	T	-	SSR32
153.	<i>Aphanamixis polystachya</i> (Wall.) R.Parker	T	-	SSR165
154.	<i>Chukrasia tabularis</i> A. Juss.	T	-	SSR100
155.	<i>Melia dubia</i> Cav.	T	-	SSR45
156.	<i>Trichilia connaroides</i> (Wight and Arn.) Benth.	T	-	SSR250
MORACEAE				
157.	<i>Ficus drupacea</i> Thunb.	T	-	SSR189
158.	<i>Ficus mollis</i> Vahl	T	-	SSR147
159.	<i>Ficus tsjahela</i> Burm.f.	T	-	SSR41
MYRISTICACEAE				
160.	<i>Knema attenuata</i> (Wall. ex Hook.f. and Thomson) Warb.	T	WG	SSR92
161.	<i>Myristica dactyloides</i> Gaertn.	T	-	SSR152
MYRSINACEAE				
162.	<i>Ardisia pauciflora</i> Heyne ex Roxb.	ST	-	SSR193
163.	<i>Maesa indica</i> (Roxb.) DC.	S	-	SSR225
MYRTACEAE				
164.	<i>Eugenia calcadensis</i> Bedd.	ST	LE	SSR119
165.	<i>Eugenia discifera</i> Gamble (Figure 4: B)	ST	SWG	SSR186
166.	<i>Eugenia floccosa</i> Bedd.	ST	LE	SSR261
167.	<i>Eugenia indica</i> (Wight) Chithra	S	SWG	SSR276
168.	<i>Eugenia mabaeoides</i> Wight	ST	SWG & SL	SSR279
169.	<i>Eugenia singampattiana</i> Bedd.	ST	LE	SSR73
170.	<i>Eugenia thwaitesii</i> Duthie	ST	-	SSR256
171.	<i>Eugenia</i> sp.	S	-	SSR48
172.	<i>Syzygium densiflorum</i> Wall. ex Wight and Arn.	T	SWG	SSR290
173.	<i>Syzygium laetum</i> (Buch.-Ham.) Gandhi	ST	WG	SSR139, 166
174.	<i>Syzygium mundagam</i> (Bourd.) Chithra	T	SWG	SSR62

TABLE 1. CONTINUED.

SL. NO.	FAMILY AND BINOMIAL	HABIT	ENDEMISM	VOUCHER NO.
175.	<i>Syzygium rubicundum</i> Wight and Arn.	T	-	SSR195
176.	<i>Syzygium tamilnadensis</i> Rathakr. and Chithra	T	WG	SSR140, 264
177.	<i>Syzygium zeylanicum</i> (L.) DC. var. <i>lineare</i> (Duthie) Alston	ST	SWG & SL	SSR89
OCHNACEAE				
178.	<i>Gomphia serrata</i> (Gaertn.) Kanis	ST	-	SSR67
179.	<i>Ochna lanceolata</i> Spreng.	T	-	SSR123
180.	<i>Ochna obtusata</i> DC.	ST	-	SSR197
OLEACEAE				
181.	<i>Ligustrum travancoricum</i> Gamble	T	-	SSR201
182.	<i>Olea polygama</i> Wight	T	-	SSR200
POACEAE				
183.	<i>Ochlandra travancorica</i> (Bedd.) Benth. ex Gamble	ST	SWG	SSR230
RHIZOPHORACEAE				
184.	<i>Carallia brachiata</i> (Lour.) Merr.	T	-	SSR15
185.	<i>Weihea zeylanica</i> Baill.	ST	-	SSR252
ROSACEAE				
186.	<i>Photinia integrifolia</i> Lindl. var. <i>sublanceolata</i> Miq.	T	-	SSR262, 272
RUBIACEAE				
187.	<i>Aidia gardneri</i> (Thw.) Tirveng.	T	-	SSR125
188.	<i>Canthium angustifolium</i> Roxb.	WC	-	SSR142
189.	<i>Canthium travancoricum</i> (Bedd.) Hook.f.	ST	SWG	SSR122
190.	<i>Gardenia resinifera</i> Roth	ST	-	SSR53
191.	<i>Haldinia cordifolia</i> (Roxb.) Ridsd.	T	-	SSR102
192.	<i>Hedyotis purpurascence</i> Hook.f.	S	SWG	SSR202
193.	<i>Hedyotis travancorica</i> Bedd. (Figure 4: C)	S	LE	SSR281
194.	<i>Ixora nigricans</i> R. Br. ex Wight and Arn.	ST	-	SSR66
195.	<i>Octotropis travancorica</i> Bedd.	T	SWG	SSR278
196.	<i>Neurocalyx calycinus</i> (R. Br. ex Benn.) Robins.	S	SWG	SSR78
197.	<i>Pavetta indica</i> L.	ST	-	SSR167
198.	<i>Psychotria flavida</i> Talbot	ST	-	SSR191
199.	<i>Psychotria nilgiriensis</i> var. <i>astephana</i> (Hook. f.) Deb et Gang.	ST	SWG	SSR289
200.	<i>Psychotria nudiflora</i> Wight and Arn. var. <i>latifolia</i> Deb et Gang.	ST	SWG	SSR209
201.	<i>Tarenna asiatica</i> (L.) Kuntze ex K. Schum. var. <i>rigida</i> forma <i>rigida</i> (Wight) Raju	T	-	SSR275
202.	<i>Tricalysia apiocarpa</i> (Dalzell) Gamble	T	WG	SSR243
203.	<i>Tricalysia sphaerocarpa</i> (Dalzell) Gamble	T	-	SSR49
RUTACEAE				
204.	<i>Acronychia pedunculata</i> (L.) Miq.	T	-	SSR109
205.	<i>Chloroxylon swietenia</i> DC.	T	-	SSR34
206.	<i>Clausena anisata</i> (Willd.) Hook.f. ex Benth.	T	-	SSR99
207.	<i>Glycosmis macrocarpa</i> Wight	ST	-	SSR226
208.	<i>Murraya paniculata</i> (L.) Jack.	T	-	SSR170
209.	<i>Pleiospermum alatum</i> (Wall. ex Wight and Arn) Swingle	T	-	SSR51
210.	<i>Vepris bilocularis</i> (Wight and Arn.) Engl.	T	WG	SSR253
211.	<i>Zanthoxylum ovalifolium</i> Wight	T	-	SSR231, 232
SABIACEAE				
212.	<i>Meliosma pinnata</i> (Roxb.) Walp. Subsp. <i>barbulata</i> (Cufod.) Beus.	T	-	SSR71
SANTALACEAE				
213.	<i>Santalum album</i> L.	T	-	SSR29
SAPINDACEAE				
214.	<i>Allophylus serratus</i> (Roxb.) Kurz	ST	-	SSR215
215.	<i>Dimocarpus longan</i> Lour.	T	-	SSR128
216.	<i>Filicium decipiens</i> (Wight and Arn.) Thw.	T	-	SSR23
217.	<i>Lepisanthes tetraphylla</i> (Vahl) Radlk	T	-	SSR288
218.	<i>Sapindus emarginatus</i> Vahl	T	-	SSR36
219.	<i>Schleichera oleosa</i> (Lour.) Oken	T	-	SSR56
SAPOTACEAE				
220.	<i>Isonandra lanceolata</i> Wight	T	-	SSR126
221.	<i>Isonandra montana</i> (Thw.) Gamble	T	-	SSR59
222.	<i>Manilkara hexandra</i> (Roxb.) Dub.	T	-	SSR39



TABLE 1. CONTINUED.

SL. NO.	FAMILY AND BINOMIAL	HABIT	ENDEMISM	VOUCHER NO.
223.	<i>Manilkara roxburghiana</i> (Wight) Dubard.	T	-	SSR121
224.	<i>Mimusops elengi</i> L.	T	-	SSR180
225.	<i>Palaquium ellipticum</i> (Dalzell) Baillon.	T	WG	SSR157
SIMAROUBACEAE				
226.	<i>Ailanthus exelsa</i> Roxb.	T	-	SSR168
STERCULIACEAE				
227.	<i>Firmiana colorata</i> (Roxb.) R. Br.	T	-	SSR129
228.	<i>Helicteres isora</i> L.	S	-	SSR08
229.	<i>Heritiera papilio</i> Bedd.	T	WG	SSR160
230.	<i>Leptonychia caudata</i> (Wall. ex G. Don) Burrett	ST	-	SSR199
231.	<i>Pterospermum diversifolium</i> Blume	T	-	SSR107
232.	<i>Pterospermum rubiginosum</i> Heyne	T	WG	SSR05
233.	<i>Sterculia guttata</i> Roxb. ex DC.	T	-	SSR116
SYMPLOCACEAE				
234.	<i>Symplocos cochinchinensis</i> (Lour.) Moore sub sp. <i>laurina</i> (Retz.) Nooteb.	T	-	SSR141
235.	<i>Symplocos macrocarpa</i> Wight ex C.B. Clarke sub sp. <i>macrocarpa</i> (Figure 4: D)	T	LE	SSR192
236.	<i>Symplocos sessilis</i> C.B. Clarke	T	LE	SSR273
THEACEAE				
237.	<i>Eurya nitida</i> Korth.	ST	-	SSR274
238.	<i>Gordonia obtusa</i> Wall. ex Wight and Arn.	T	WG	SSR110
TILIACEAE				
239.	<i>Grewia lanceifolia</i> Roxb.	T	-	SSR145
ULMACEAE				
240.	<i>Celtis philippensis</i> Blanco. var. <i>wightii</i> (Planch.) Soep.-admo	T	-	SSR16
241.	<i>Trema orientalis</i> (L.) Blume	T	-	SSR74
URTICACEAE				
242.	<i>Dendrocnide sinuata</i> (Blume) Chew	ST	-	SSR227
243.	<i>Oreocnide integrifolia</i> (Gaudich.) Miq.	ST	-	SSR164
244.	<i>Pilea melastomoides</i> (Poirot) Wedd.	T	-	SSR242
VACCINIACEAE				
245.	<i>Vaccinium neilgherrense</i> Wight (Figure 4: E)	T	-	SSR269
VERBENACEAE				
246.	<i>Callicarpa tomentosa</i> (L.) Murr. (Figure 4: F)	T	-	SSR185
XANTHOPHYLLACEAE				
247.	<i>Xanthophyllum arnottianum</i> Wight	T	-	SSR42, 270

ACKNOWLEDGMENTS: We thank Shri R. Sundararaju, Principal Chief Conservator of Forests and Chief Wildlife Warden (Retd.), Tamil Nadu Forest Department, Chennai and Shri A. Ramkumar Former Chief Conservator of Forests and Field Director, Project Tiger, KMTR and Shri H. Malleshappa, Chief Conservator of Forests and Field Director, Project Tiger, KMTR, for their support throughout the field work. We would like to thank Mr. Jeykumar Kani, Anti-poaching Watcher, Mundanthurai Range, KMTR, for his constant support, and assistance during the field work. We extend our thanks to Dr. S. Ravi Shankar, Assistant Professor, Department of Botany, Madras Christian College, Chennai, for his valuable suggestion and help in the manuscript preparation. We also thank Dr. W. Arisdason, Assistant Professor, Department of Botany, Madras Christian College, Chennai, for his help in plant authentication.

LITERATURE CITED

Annamalai, R. 2004. *Biodiversity of Kalakad-Mundanthurai Tiger Rerserve*. Tamil Nadu: Tamil Nadu Forest Department. Government of Tamil Nadu. 358 p.

Beddome, R.H. 1869-73. *The Flora Sylvatica of Southern India*. Gantz Brothers, Madras. 330 Plates, 3 Vol. Dehra Dun: International Book Distributors. 519 p.

Bentham, G. and J.D. Hooker 1862-1883. *Genera Plantarum*. Vols. 1-3. L. London: Reeve & Co.,. 3577 p.

Bourdillon, T.F. 1908. *The Forest Trees of Travancore*. Trivandrum, Kerala: Travancore Government Press. 456 p.

Davis, S.D., V.H. Heywood and A.C. Hamilton. 1995. *Centres of Plant Diversity: A Guide and Strategy for their Conservation. Volume 2: Asia, Australasia and the Pacific*. WWF and IUCN: Cambridge. 578 p.

Gamble, J.S. and C.E.C. Fischer (1915-1936). *The flora of the Presidency of Madras*. Part I- II. London: Adlard & Son and West New man Ltd.

1389 p.

Ganesh, T., R. Ganesan, M. Soubadra Devy, P. Davidar and K.S. Bawa. 1996. Assessment of plant diversity at a mid-elevation evergreen forest of Kalakad-Mundanthurai Tiger Reserve, Western Ghats, India. *Current Science* 71(5): 379-392.

Gopalan, R. and A.N. Henry. 2000. *Endemic Plants of India: CAMP for the strict endemics of Agasthiyamalai Hills, Southern Western Ghats*. Dehra Dun: Bishen Singh Mahendra Pal Singh. 476 p.

Henry, A.N., M. Chandrabose, M.S. Swaminathan and N.C. Nair. 1984. Agastyamalai and its environ: A potential area for a Biosphere reserve. *Journal of Bombay Natural History Society* 81: 282-290.

Johnsingh, A.J.T. 2001. The Kalakad-Mundanthurai Tiger Reserve: A global heritage of biological diversity. *Current Science* 80(3): 378-388.

Jothi, G.J., V.S. Manickam, V. Sundaresan and M.M. Josephine. 2002. New species of *Glochidion* Forst. (Euphorbiaceae) from southern India. *Journal of Economic and Taxonomic Botany* 26(1): 114-116.

Kaveriappa, K.M. and B.V. Shetty. 2001. Biodiversity of Western Ghats with special reference to conservation of plant diversity at Kaiga. *International Journal of Nuclear Power* 15(1): 40-42.

Manickam, V. S., G. Jeya Joithi, C. Murugan and V. Sunderasan. 2003. *Check-list of the flora of Tirunelveli Hills, Southern Western Ghats, India*. Tamilnadu: Centre for Biodiversity and Biotechnology (CBB), St. Xavier’s college, Palayamkottai. 200 p.

Manickam, V.S., C. Murugan, V. Sunderasan and G.J. Joithi, 2007. *Schefflera agasthiyamalayana*, a new species of Araliaceae from southern Western Ghats, India. *Indian Journal of Forestry* 30(1): 61-62.

Mohanan, N. and M. Sivadasan. 2002. *Flora of Agasthyamala*. Bishen Singh Mahendra Pal Singh, Dehra Dun, India. 889 p.

Murugan, C. 2002. Newspecies of *Xanthophyllum* Roxb. (Xanthophyllaceae) and *Eugenia* L. (Myrtaceae) from Peninsular India. *Journal of*

- Economic and Taxonomic Botany* 26(2): 413-418.
- Murugan, C., V.S. Manickam, V. Sunderasan and G. J. Jothi. 2004. *Miliusa tirunelvelica*, a New Species of Annonaceae from the Kalakkad-Mundanthurai Tiger Reserve, Western Ghats, India. *Novon* 14(1): 102-104.
- Murugan, C., V. Sundaresan and G.J. Jothi. 2000. *Memecylon manickamii*, a new species of Melastomataceae from the Western Ghats of Tamil Nadu. *Kew Bulletin* 55: 1001-1003.
- Murugan, C., V.S. Manickam and V. Sundaresan. 2001. *Memecylon tirunelvelicum*, a new species of Melastomataceae from Peninsular India. *Novon* 11: 197-199.
- Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. da Fonseca, and J. Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858.
- Pascal, J.P. and R. Pelissier. 1996. Structure and floristic composition of a tropical evergreen forest in southwest India. *Journal of Tropical Ecology* 12: 191-214.
- Pascal, J.P., B.R. Ramesh and C. Nouguier. 1997. *Atlas of Endemics of the Western Ghats (India): Distribution of tree species in the evergreen and semi-evergreen forests*. Pondicherry: Institut Francais de Pondichéry. 403p.
- Parthasarathy, N. 1999. Tree diversity and distribution in undisturbed and human-impacted sites of tropical wet evergreen forest in southern Western Ghats, India. *Biodiversity and Conservation* 8: 1365-1381.
- Ramesh, B. R. and J.P. Pascal. 1991. Distribution of endemic, arborescent evergreen species in the Western Ghats; p. 20-29. *In Proceedings of the Symposium on Rare, Endangered and Endemic Plants of the Western Ghats. Kerala Forest Department, India*. Kerala: Department of Forest.
- Ramesh, B.R., N. Ayyappan, P. Grard, J. Prosperi, S. Aravajy and J.P. Pascal. 2007. *BIOTIK-Western Ghats v 1.0: a multimedia identification systems of evergreen tree species of the Western Ghats, India*.
- Tissot, C., H. Chikhi, and T.S. Nayar. 1994. *Pollen of wet evergreen forests of the Western Ghats, India*. Pondicherry: All India Press. 132 p.
- Viswanathan, M.B. 1999. Plant diversity of the Kalakkad-Mundanthurai Tiger Reserve (KMTR), Tamil Nadu-A conservationist view; p. 189-213 *In* M. Sivadasan and P. Mathew (ed). *Biodiversity, Taxonomy and Conservation of Tropical Flowering Plants*. Calicut: Mentor Books.
- Viswanathan, M.B. and U. Manikandan. 2001a. A new species, *Memecylon mundanthuraianum*, of Melastomataceae from India. *Nordic Journal of Botany* 21(3): 259-262.
- Viswanathan, M.B. and U. Manikandan. 2001b. *Polyalthia tirunelveliensis* (Annonaceae), a new species from Peninsular India. *Kew Bulletin* 56 (1): 217-221.
- Viswanathan M.B. and U. Manikandan U. 2008. A new species of Syzygium (Myrtaceae) from the Kalakkad-Mundanthurai Tiger Reserve in Peninsular India. *Adansonia*, sér. 3, 30(1): 113-118.

RECEIVED: August 2011

ACCEPTED: August 2012

PUBLISHED ONLINE: September 2012

EDITORIAL RESPONSIBILITY: Marco Schmidt